

5-1

Skills Practice

Monomials

Simplify. Assume that no variable equals 0.

1. $b^4 \cdot b^3$

b^7

2. $c^5 \cdot c^2 \cdot c^2$

c^9

3. $a^{-4} \cdot a^{-3}$

$a^{-7} = \frac{1}{a^7}$

4. $x^5 \cdot x^{-4} \cdot x$

x^2

5. $(g^4)^2$

g^8

6. $(3u)^3$

$27u^3$

7. $(-x)^4$

x^4

8. $-5(2z)^3$

$-5 \cdot 8z^3$

$-40z^3$

9. $-(-3d)^4$

$81d^4$

$-81d^4$

10. $(-2t^2)^3$

$-8t^6$

$-8t^6$

11. $(-r^7)^3$

$-r^{21}$

12. $\frac{s^{15}}{s^{12}}$

s^3

13. $\frac{k^9}{k^{10}}$

$\frac{1}{k}$

14. $(-3f^3g)^3$

$-27f^9g^3$

15. $(2x)^2(4y)^2$

$4x^2 \cdot 16y^2$

$64x^2y^2$

16. $-2gh(g^3h^5)$

$-2g^4h^6$

17. $10x^2y^3(10xy^8)$

$100x^3y^{11}$

18. $\frac{24wz^7}{3w^3z^5}$

$\frac{8z^2}{w^2}$

19. $\frac{-6a^4bc^8}{36a^7b^2c}$

$-\frac{c^7}{6a^3b}$

20. $\frac{-10pq^4r}{-5p^3q^2r}$

$\frac{2q^2}{p^2}$

Express each number in scientific notation.

21. 53,000

5.3×10^4

22. 0.000248

2.48×10^{-4}

23. 410,100,000

4.101×10^8

24. 0.00000805

8.05×10^{-6}

Evaluate. Express the result in scientific notation.

25. $(4 \times 10^3)(1.6 \times 10^{-6})$

26. $\frac{9.6 \times 10^7}{1.5 \times 10^{-8}}$

5-2 Practice

Polynomials

Determine whether each expression is a polynomial. If it is a polynomial, state the degree of the polynomial.

1. $5x^3 + 2xy^4 + 6xy$ yes; 5
 2. $-\frac{4}{3}ac - a^5d^3$ yes 8
 3. $\frac{12m^8n^9}{(m-n)^2}$ no
 4. $25x^3z - x\sqrt{78}$ yes; 4
 5. $6c^{-2} + c - 1$ no
 6. $\frac{5}{r} + \frac{6}{s}$ no

Simplify.

7. $(3n^2 + 1) + (8n^2 - 8)$
 8. $(6w - 11w^2) - (4 + 7w^2)$
 9. $(-6n - 13n^2) + (-3n + 9n^2)$
 $-9n - 4n^2$
 10. $(8x^2 - 3x) - (4x^2 + 5x - 3)$
 11. $(5m^2 - 2mp - 6p^2) - (-3m^2 + 5mp + p^2)$
 $-x^2 + 3xy + 4y^2$
 12. $(2x^2 - xy + y^2) + (-3x^2 + 4xy + 3y^2)$
 13. $(5t - 7) + (2t^2 + 3t + 12)$
 14. $(u - 4) - (6 + 3u^2 - 4u)$
 15. $-9(y^2 - 7w)$
 $-9y^2 + 63w$
 16. $-9r^4y^2(-3ry^7 + 2r^3y^4 - 8r^{10})$
 17. $-6a^2w(a^3w - aw^4)$
 $5a^4w^9 - 15a^6w^5 + 45a^3w^9$
 18. $5a^2w^3(a^2w^6 - 3a^4w^2 + 9aw^6)$
 19. $2x^2(x^2 + xy - 2y^2)$
 $20. -\frac{3}{5}ab^3d^2(-5ab^2d^5 - 5ab)$
 21. $(v^2 - 6)(v^2 + 4)$
 $v^4 + 4v^2 - 6v^2 - 24$
 $v^4 - 2v^2 - 24$
 22. $(7a + 9y)(2a - y)$
 $(x^2 + 5y)(x^2 + 5y)$
 23. $(y - 8)^2$
 $x^4 + 10x^2y + 25y^2$
 24. $(x^2 + 5y)^2$
 25. $(5x + 4w)(5x - 4w)$
 $w^3 - 2w^2s + 4ws^2 + 2sw^2 - 4ws^2 + 8s^3$
 26. $(2n^4 - 3)(2n^4 + 3)$
 27. $(w + 2s)(w^2 - 2ws + 4s^2)$
 $w^3 + 8s^3$
 28. $(x + y)(x^2 - 3xy + 2y^2)$

29. **BANKING** Terry invests \$1500 in two mutual funds. The first year, one fund grows 3.8% and the other grows 6%. Write a polynomial to represent the amount Terry's \$1500 grows to in that year if x represents the amount he invested in the fund with the lesser growth rate.

30. **GEOMETRY** The area of the base of a rectangular box measures $2x^2 + 4x - 3$ square units. The height of the box measures x units. Find a polynomial expression for the volume of the box.

5-3

Practice

Dividing Polynomials

Simplify.

1. $\frac{15r^{10} - 5r^8 + 40r^2}{5r^4}$

2. $\frac{6k^2m - 12k^3m^2 + 9m^3}{2km^2}$

3. $(-30x^3y + 12x^2y^2 - 18x^2y) \div (-6x^2y)$

4. $(-6w^3z^4 - 3w^2z^5 + 4w + 5z) \div (2w^2z)$

5. $(4a^3 - 8a^2 + a^2)(4a)^{-1}$

6. $(28d^3k^2 + d^2k^2 - 4dk^2)(4dk^2)^{-1}$

7. $\frac{f^2 + 7f + 10}{f + 2}$

8. $\frac{2x^2 + 3x - 14}{x - 2}$

9. $(a^3 - 64) \div (a - 4)$

10. $(b^3 + 27) \div (b + 3)$

11. $\frac{2x^3 + 6x + 152}{x + 4}$

12. $\frac{2x^3 + 4x - 6}{x + 3}$

13. $(3w^3 + 7w^2 - 4w + 3) \div (w + 3)$

14. $(6y^4 + 15y^3 - 28y - 6) \div (y + 2)$

15. $(x^4 - 3x^3 - 11x^2 + 3x + 10) \div (x - 5)$

16. $(3m^5 + m - 1) \div (m + 1)$

17. $(x^4 - 3x^3 + 5x - 6)(x + 2)^{-1}$

18. $(6y^2 - 5y - 15)(2y + 3)^{-1}$

19. $\frac{4x^2 - 2x + 6}{2x - 3}$

20. $\frac{6x^2 - x - 7}{3x + 1}$

21. $(2r^3 + 5r^2 - 2r - 15) \div (2r - 3)$

22. $(6t^3 + 5t^2 - 2t + 1) \div (3t + 1)$

23. $\frac{4p^4 - 17p^2 + 14p - 3}{2p - 3}$

24. $\frac{2h^4 - h^3 + h^2 + h - 3}{h^2 - 1}$

25. **GEOMETRY** The area of a rectangle is $2x^2 - 11x + 15$ square feet. The length of the rectangle is $2x - 5$ feet. What is the width of the rectangle?

26. **GEOMETRY** The area of a triangle is $15x^4 + 3x^3 + 4x^2 - x - 3$ square meters. The length of the base of the triangle is $6x^2 - 2$ meters. What is the height of the triangle?

LONG

$$f + 5$$

$$7. \quad f+2 \overline{) f^2 + 7f + 10}$$

$$- f^2 + 2f$$

$$5f + 10$$

$$- 5f + 10$$

0

$$(f+5)$$

$$a^2 + 4a + 16$$

$$9. \quad a-4 \overline{) a^3 + 0a^2 + 0a - 64}$$

$$- a^3 + 4a^2$$

$$4a^2 + 0a$$

$$- 4a^2 + 16a$$

$$16a - 64$$

$$- 16a + 64$$

0

$$(a^2 + 4a + 16)$$

$$2x^2 - 8x + 38$$

$$\frac{120}{32}$$

$$11. \quad x+4 \overline{) 2x^3 + 0x^2 + 6x + 152}$$

$$- 2x^3 + 8x^2$$

$$- 8x^2 + 6x$$

$$+ 8x^2 + 32x$$

$$38x + 152$$

$$- 38x + 152$$

0

$$(2x^2 - 8x + 38)$$

Syn.

$$\begin{array}{r|rrrr}
 13. & -3 & 3 & 7 & -4 & 3 \\
 & & -9 & 6 & -6 & \\
 \hline
 & & 3 & -2 & 2 & | -3
 \end{array}$$

$$3w^2 - 2w + 2 + \frac{-3}{w+3}$$

$$\begin{array}{r|rrrrrr}
 15. & 5 & 1 & -3 & -11 & 3 & 10 \\
 & & 5 & 10 & -5 & -10 & \\
 \hline
 & & 1 & 2 & -1 & -2 & | 0
 \end{array}$$

$$x^3 + 2x^2 - x - 2$$

$$\begin{array}{r|rrrrrr}
 17. & -2 & 1 & -3 & 0 & 5 & -6 \\
 & & -2 & 10 & -20 & +30 & \\
 \hline
 & & 1 & -5 & 10 & -15 & | 24
 \end{array}$$

$$x^3 - 5x^2 + 10x - 15 + \frac{24}{x+2}$$

19. Factor out 2 from denom, $2(x - \frac{3}{2})$

$$\begin{array}{r|rr}
 \frac{3}{2} & 4 & -2 & 6 \\
 & 6 & 6 & \\
 \hline
 & 4 & 4 & | 12
 \end{array}$$

$$\frac{1}{2} \left(4x + 4 + \frac{12}{x - \frac{3}{2}} \right)$$

$$2x + 2 + \frac{12}{2x-3}$$